

JAMES MIDDLEBROOKS, CBS Liaison Engineer

In writing this absorbing article about the new KNX-CBS plant here (especially for this souvenir edition) Engineer Middlebrooks declares . . .

"It is the most efficient transmitter in the world!"

His analysis of the \$350,000 station contains many significant observations concerning its structural design, its resistance to possible earth tremors, and its broadcasting equipment



By JAMES MIDDLEBROOKS, CBS Liaison Engineer
Written especially for "Torrance-On-the-Air" Herald edition

WHEN the Columbia Broadcasting System decided to erect a new transmitter station south of Los Angeles, near the coast, they determined to take unusual precautions to make the plant earthquake resistant, for it is well recognized that this region is subject to seismic activity.

In 1933 a disastrous earthquake occurred at Long Beach. The U. S. Coast and Geodetic Survey, previous to the occurrence of the earthquake, had strong motion seismograph instruments set up in Long Beach and for the first time immediate instrumental data was obtained on an earthquake strong enough to demolish buildings. From this instrumental data it was indicated that horizontal earth accelerations reached a maximum of about 25 hundredths of that caused by the force of gravity.

With this knowledge, the engineers used in designing the transmitter building, a theoretical force acting horizontally on the building equal to that which would be caused by 25 hundredths of gravity acceleration. Recent legislation in California required that all public school buildings be designed to resist a force caused by one-tenth gravity acceleration; and the requirement for commercial buildings in Los Angeles is somewhat less.

Strata Aids Grounding

From this comparison it will be seen that the transmitter station is designed to withstand a lateral force two and one-half

times that required by law for school buildings.

The site selected by CBS in Torrance is covered with loose wind blown dune sand to a depth of about four feet. Under this covering is a stratum of dense clayey sand approximately seven feet thick at the building site. This clayey stratum is sufficiently impermeable to maintain a high moisture content at its upper surface, thus aiding in electrically grounding the metal work of equipment and buildings. Below the clayey stratum are several hundred feet of densely bedded marine terrace deposits.

The transmitter consists of the transmitter room, offices, laboratory, living quarters, machine rooms and garage. The transmitter room is 16 sided, 54 feet across and 35 feet high. Eleven feet above the floor a five-foot observation walk completely encircles the inside of the room. At this same level are located the operator's desk and the radio panel boards.

Is Completely Independent

Tangent to the perimeter of the transmitter room is a wing 22 feet wide by 98 feet long
(Continued on Col. 4)



EXECUTIVE . . . D. W. Thornburgh, vice-president in charge of CBS Pacific coast operations, has taken a keen interest in the construction of the new KNX-CBS transmitter here. He will be one of the outstanding guests at the dedication-dinner-broadcast Friday, Sept. 16, starting at 7 p. m.



SUPERVISOR . . . Leo Shepard, whose years in radio date back almost to the beginning of commercial broadcasting, is in charge of the new KNX-CBS transmitter station in Torrance.

consisting of a basement and first story. The first floor is level with the transmitter room observation walk. On the first floor of this wing are located the main office, laboratory, parts storage and living quarters. In the basement are machinery rooms and the garage.

CBS has made this plant so that it can be completely independent in operation. In case of a disaster that would take out the two independent power supply lines there is installed in the basement a stand-by gasoline powered motor generator to develop electricity. If all telephone service should be cut off, there is a short wave transmitter and receiver to carry on communication.

Two radio engineers will be on duty at all times and their apartment in the building is fully equipped, including electric stove and refrigerator and plenty of food stores. The station's own well and tank for domestic water is the final touch of independence of outside sources of supply.

Has Unique Illumination

The design of the building to resist earthquakes was carefully thought out. The footings were carried down to the clayey sand and the intensity of load on the footings was kept low. The building is entirely of reinforced concrete with the reinforcing steel placed so that the whole structure is knit together into a rigid unit. Torsional stresses due to the irregular shape of the structure are carried back to the transmitter room walls and absorbed by them as a hub.

The roof of the office wing is about half way up the wall of the transmitter room and to prevent any chance of damage to the wall at this point when under severe earthquake stress, a two-inch separation was made between the roof and wall.

The roof of the transmitter room spans the entire 54 feet. Its space framing is in the form of a dished wheel with the hub four feet higher than the rim. Beams radiate from the central hub to each intersection of the 16 faces of the room. With the

room thus broken up into many surfaces it is surprising to note the small amount of sound vibration and echo. Lighting of the ceiling is accomplished by vertical flood lights placed near the center of the room and on top of the panel boards. This is sufficient illumination for the entire room.

All Metal Is Grounded

Located back of the panel boards are two radio tubes for final amplification. These tubes give off so much heat that they must be cooled by circulating water around them. The water thus heated is passed through a radiator and the heat delivered to the ventilating system of the transmitter room.

It is estimated that there will be sufficient heat derived in this way to keep the room comfortable when the temperature outside is as low as 35 degrees F. Automatic dampers control the amount of heat thus used from maximum in cold weather to none in warm weather.

The close spacing of reinforcing steel in the walls, roof and floors of the building affords a good electrical shield which with all metal window and door frames, stair rails and all loose metal work is grounded with copper wire, attached at frequent intervals, leading to the grounding mat at the foot of the radiator mast. In addition to the general shielding of the building, the laboratory room is completely surrounded with copper mesh embedded in the plaster of the walls and ceiling and in the cement finish of the floor.

Tower Design Explained

The station sends out its radio waves from a single mast located about 550 feet from the building. The mast itself is the antenna. It is made of round steel rods welded together to form a triangular section, the legs being four feet apart on each side and extending to a height of 490 feet from the base.

The legs vary in size from 1 1/2 inches to 2 1/2 inches in diameter according to the requirements at various points in the mast and are tied together with

(Continued on Page 34)

Explaining Photos Shown on Left

Pictured on the preceding full page lay-out is some of the most modern broadcast transmitting equipment in the world and the men who operate it at the new KNX-CBS station here.

TOP LEFT . . . FINAL AMPLIFIER: This inside view of the final amplifier shows a portion of the tuning elements necessary to adjust it for correct operation on KNX's assigned carrier frequency of 1050 kilocycles.

TOP RIGHT . . . PHASE SHIFTING NETWORK: Of carrier enables KNX to operate its final amplifier at highest efficiency. This final amplifier is the last in a series of volume boosting units before the developed radio energy is sent to the 490-foot antenna tower. From that high point radio waves are sent out to home receiving sets.

CENTER . . . TECHNICAL STAFF: Left to right are John Reinwald, Jr., Leo Shepard, supervisor; Warren Birkenhead, Ed Olds, Herb Pangborn, Ben Harper and, in foreground, Russell Stanton. Not present when photo was taken are George Miller and Frank Ottoboni, also members of the staff.

LOWER LEFT . . . FIVE KILOWATT DRIVER STAGE: Showing inductances and air-cooled tube. This view reveals a portion of the equipment where the program is actually superimposed on the 1050 kilocycle frequency upon which KNX operates. Carrier frequency is developed in a prior section of the transmitter. It is in this driver stage that the audible radio program produced at the studio is superimposed on the carrier frequency. Program is further amplified by the final tube assembly and is then sent to the 490-foot tower.

LOWER RIGHT . . . CONTROL DESK: It is from this point that the transmitter engineer surveys his realm of technical equipment. Panel in background is front view of final amplifier stage.

CONGRATULATIONS to KNX

We Join The Citizens of Torrance In Welcoming
The Beautiful, New Transmitter to This City!

TORRANCE THEATRE

TORRANCE